

1782-JDA4
SmartMux-Lite™ / DeviceNet™
User's Manual



Western Reserve Controls, Inc.

Although every effort has been made to insure the accuracy of this document, all information is subject to change without notice. WRC takes no liability for any errors in this document or for direct, indirect, incidental or consequential damage resulting from the use of this manual.

Document PUB 12.0
Rev 1.00
Sept 1997

Copyright © 1997 WRC

Western Reserve Controls, Inc.

526 South Main Street, Suite 310
Akron OH 44311
330-762-1611 (Phone)
330-762-1622 (FAX)
sales@wrcakron.com (Email)
<http://www.wrcakron.com> (Web)

SmartMux, SmartMux-Lite and WRC are trademarks of Western Reserve Controls.
DeviceNet is a trademark of the Open DeviceNet Vendor Association ("ODVA").
All other trademarks are property of their respective companies.

TABLE OF CONTENTS

1. OVERVIEW	1
1.1. FEATURES	1
1.2. DEVICENET SYSTEM CONFIGURATION	1
1.3. BASIC OPERATION	2
1.3.1. Polled I/O	2
1.3.2. Cyclic I/O.....	2
1.3.3. Bit-Strobe Message.....	2
2. USING THIS MANUAL.....	3
3. QUICK START.....	4
4. GENERAL SPECIFICATIONS	5
5. HARDWARE INSTALLATION AND CONFIGURATION	6
5.1. OVERVIEW	6
5.2. CONFIGURATION	7
5.3. LED OPERATION	7
5.4. ANALOG I/O.....	8
5.4.1. Field I/O Wiring	9
5.5. POWER REQUIREMENTS	9
5.6. NETWORK CONFIGURATION	10
5.6.1. Network Termination.....	10
5.6.2. DeviceNet Connection Wiring	11
6. DEVICENET PROFILE AND DEVICENET OBJECTS	13
6.1. ANALOG INPUT POINT OBJECT - CLASS 0A _{HEX}	13
6.1.1. Analog Input Assembly Data Format	13
6.1.2. Attributes and Services	14
6.2. ANALOG INPUT GROUP OBJECT - CLASS 20 _{HEX}	14
6.2.1. Analog Input Group Assembly Data Format.....	15
6.2.2. Attributes and Services	15
6.3. ACKNOWLEDGE HANDLER OBJECT - CLASS 2B _{HEX}	16
6.3.1. Attributes and Services	16
6.4. ASSEMBLY OBJECT	17
6.5. I/O CONNECTION INSTANCES.....	18
7. ACCESSORIES	19
8. TROUBLESHOOTING	20

LIST OF TABLES

TABLE 5-1	MODULE STATUS LED (LABELED MS)	7
TABLE 5-2	NETWORK STATUS LED (LABELED NS)	8
TABLE 5-3	1781 SERIES ANALOG I/O MODULES	8
TABLE 5-4	WRC7 SERIES ANALOG I/O MODULES	8
TABLE 5-5	ANALOG INPUT I/O TERMINALS	9
TABLE 5-6	JDA4 POWER REQUIREMENTS	10
TABLE 5-7	NETWORK MAXIMUM LENGTHS	10
TABLE 5-8	DEVICENET WIRING TERMINATION	11
TABLE 5-9	DEVICENET CONDUCTOR SIZES	12
TABLE 6-1	JDA4 DEVICE PROFILE	13
TABLE 6-2	JDA4 ANALOG INPUT ASSEMBLY DATA ATTRIBUTE FORMAT	13
TABLE 6-3	CLASS 0A _{HEX} CLASS ATTRIBUTES	14
TABLE 6-4	CLASS 0A _{HEX} INSTANCE ATTRIBUTES	14
TABLE 6-5	ANALOG INPUT COMMON SERVICES	14
TABLE 6-6	JDA4 ANALOG OBJECT ASSEMBLY INSTANCE DATA FORMAT (INSTANCE 1)	15
TABLE 6-7	CLASS 20 _{HEX} CLASS ATTRIBUTES	15
TABLE 6-8	CLASS 20 _{HEX} INSTANCE ATTRIBUTES	16
TABLE 6-9	ANALOG INPUT GROUP COMMON SERVICES	16
TABLE 6-10	CLASS 2B _{HEX} CLASS ATTRIBUTES	17
TABLE 6-11	CLASS 2B _{HEX} INSTANCE ATTRIBUTES	17
TABLE 6-12	ACKNOWLEDGE HANDLER COMMON SERVICES	17

LIST OF FIGURES

FIGURE 5-1	1782-JDA4 SMARTMUX-LITE	6
FIGURE 5-2	DEVICENET CABLE CONNECTOR	12
FIGURE 5-3	DEVICENET CABLE SPECIFICATIONS	12

1. Overview

The 1782-JDA4 SmartMux-Lite™ is a remote industrial I/O device that multiplexes analog data acquisition and control signals in industrial or commercial applications. The 1782-JDA4 is DIN-mounted I/O multiplexers and supports serial communications on a DeviceNet™ link.

The 1782-JDA4 multiplexes four (4) points of analog I/O through WRC's 1781-7B Series or WRC7 Series analog single point I/O modules, which plug directly into the multiplexer assembly. The 1782-JDA4 (also referred to as "JDA4" or SmartMux-Lite) connect these analog I/O signals to a DeviceNet communications system. Each input channel may be any voltage range desired, based upon the module selected.

The SmartMux-Lite multiplexer is designed as a Group 2 Only Server on the DeviceNet system and its I/O is read by and written to by another device on the link defined as a DeviceNet Master (Client). JDA4 supports the Predefined Master/Slave Explicit Message Connection, Polled I/O, Cyclic I/O and Bit-Strobe.

The device address, data rate and other parameters are software-configurable and are changed from the default by a third-party configuration tool. There are no jumpers and switches for the user to set. Each JDA4 has 2 green/red LEDs - one for module status and one for network status. Section 5 of this document describes the installation of the JDA4 multiplexer.

1.1. Features

The 1782-JDA4 has the following features:

- 4 Analog Input Channels - 10-bit conversion
- Uses Industry-Standard "7B" Modules
- Wide Range of Analog Inputs Available - T/C, RTD, Strain Gage, 4-20 mA, etc.
- Point-by-Point Mix-and-Match Analog Signals by Module Selection
- Isolated Analog Input signals available - up to 1500 V
- Polled, Cyclic and Bit-Strobe I/O
- Software Configurable Parameters
- DeviceNet compatible

WRC also provides other SmartMux-Lite products for discrete and analog I/O signal conditioning and multiplexing on DeviceNet: the 1782-JDB4 and 1782-JDB8 for 4 and 8 discrete points, respectively, and the 1782-JDA8 for 8 channels of analog and discrete I/O. In addition, WRC also provides products to extend DeviceNet and other CAN-based networks. These are the WRC-CANEXT series of CAN bus repeaters.

1.2. DeviceNet System Configuration

A DeviceNet network is a distributed I/O system that may contain many different products from several different vendors. Products may be configured uniformly, as clusters, or as distributed clusters. Up to 64 devices, including the master, may be attached to a single DeviceNet network. Any of these, except the master, may be a SmartMux-Lite. A typical system will include a master, such as a PLC or industrial PC, and multiple slave devices.

1.3. Basic Operation

The JDA4 operates as an analog input device on the DeviceNet network. It is a slave device which can be assigned (allocated) by the system implementer to one specific master. The analog input data is a 10-bit conversion of the isolated signals coming from the 1781-7B or WRC7 Series Analog I/O Modules. These 10 bits are reported as a 2-byte value, with a range of 0 to 1023 counts, full-scale. The DeviceNet Master can receive the analog data from the JDA4 via the several methods described in this section.

1.3.1. Polled I/O

The master can explicitly poll (interrogate) the analog input data from the JDA4. The analog data is returned to the master in a Polled Response Message.

1.3.2. Cyclic I/O

Cyclic I/O is the function by which a slave device sends all its input data to the master at a specific time period without the host explicitly requesting it. When the specified time interval elapses the entire input data (all four analog input channels) are transmitted to the master. The only user-defined configuration required is to set up the time interval.

1.3.3. Bit-Strobe Message

A Bit-Strobe Message is a very fast method by which the master can send one bit to and receive up to 8 bytes of data response from each slave device on the network. The JDA4 supports the Bit-Strobe feature and returns its 4 channels of input data as a Bit-Strobe Response when the Master sends a Bit-Strobe Command. The JDA4 ignores the one bit sent to it in the command message. No user-defined configuration is required.

2. Using This Manual

This manual serves to help the user to understand the capabilities of the SmartMux-Lite product family, how to install and configure an I/O subsystem using these products, and how to generate the commands from the system host to read data from or write data to the SmartMux-Lite.

Section 3 describes how to quickly connect your SmartMux-Lite and get it up and running on the DeviceNet link.

Section 4 provides the technical specifications for the products described in this manual.

Section 5 describes the installation of the hardware, including mounting, connection to other I/O subsystem components, power requirements and configuration of the operating parameters of the SmartMux-Lite.

Section 6 describes the DeviceNet Profile and DeviceNet Object data for these products.

Section 7 lists common accessories that are used with the JDA4.

Section 8 provides some troubleshooting hints in the event your SmartMux-Lite or I/O system is not operating as anticipated.

3. Quick Start

To quickly and easily install your SmartMux-Lite in your DeviceNet system, follow the instructions below. For more details, see Section 5.

To Install and DeviceNet Establish Communications

1. Remove the SmartMux-Lite from the box and connect your DeviceNet cable to the 5-pin plug (supplied) according to DeviceNet cable wiring specifications.
2. Make sure that the DeviceNet network is terminated properly.
3. Plug in your analog input modules. (**Warning:** Do **not** insert or remove the modules under power.)
4. Make sure that there is power on the DeviceNet network and plug the cable into the SmartMux-Lite.
5. The SmartMux-Lite will undergo its initialization sequence, flashing both LEDs. After approximately 5 seconds, the Module Status LED (labeled "MS") will go on solid green and network LED will flash green.
6. The green Network Status LED (labeled "NS") will go on solid once the Master recognizes the unit on the link and allocates the connection.
7. The SmartMux-Lite is now operating on the network.

To Configure the Node Address and Baud Rate

1. You may change the device address and/or the baud rate, using your configuration tool or a command from the Master. (Defaults are 63 and 125k baud.)
2. If you change the device address, the SmartMux-Lite will reset and assume the address.
3. If you change the baud rate, the new baud rate will not become effective until the unit is power cycled or a Reset command is received from the Master.

To Read Analog Input Data

1. Allocate a Poll Connection (Connection Instance 2) to the SmartMux-Lite from the Master.
2. Perform a poll command to the SmartMux-Lite from the Master. The input channel values will be available in bytes 0 - 7 of the response.

4. General Specifications

Product:	1782-JDA4 SmartMux-Lite DeviceNet for Single-Point Analog 7B Input Modules		
Description:	Remote multiplexer, compatible with ODVA's DeviceNet protocol for analog input signals, which will directly support up to four (4) WRC 1781-7B or WRC7 series analog input modules		
Device Type:	General Purpose Analog I/O		
Device Profile:	Analog Input: Class 0x0A _{hex} , Analog Input Group: Class 0x20 _{hex}		
Product Revision:	1.00		
DeviceNet Conformance:	Designed to conform to the ODVA DeviceNet Specification Volume I, Version 1.2 and Volume II, Version 1.1.		
Communications:	Predefined Master/Slave Connection Set, Group 2 Only Server		
Baud rate:	125k, 250, 500k - software selectable (default = 125k)		
Address selection:	Address number 1 to 63, software selectable (default = 63)		
DeviceNet Connection:			
	SmartMux-Lite:	5-pin pluggable header (male) Phoenix Contact MSTBA 2.5/5-G-5.08/AU	
	DeviceNet Cable:	5-contact plug (female contacts) Phoenix Contact MSTB 2.5/5-ST-5.08/AU (included)	
Status Indicators:	Module Status:	green/red bi-color LED	
	Network Status:	green/red bi-color LED	
Voltage Isolation:	Defined and provided by I/O modules (1500V typical)		
Maximum power:	8 watts: 730 mA @ 11 Vdc - 320 mA @ 25 Vdc unregulated power supply, including analog modules (power provided by the DeviceNet network)		
Analog Inputs:	up to four (4) WRC 1781-7B or WRC7 Series or equivalent input modules 0-10 Vdc output option (do not select the -P suffix; see Section 5.4 for details) refresh rate <500 usec for all inputs 10-bit ADC Cold-junction compensation included for each point position		
I/O Wiring:	4, 3-pole screw terminal connectors. I/O wire size: stranded 12 - 26 AWG solid 14 - 26 AWG		
Mounting:	DIN rail mount, EN 50022		
Size:	Width: 4.17" (106,0 mm) Height: 3.56" (90,4 mm) Depth: 1.75" (44,4 mm) - without modules, excluding DIN rail 3.69" (93,70 mm) - with modules, excluding DIN rail		
Operating Temp:	0-70 °C		
Humidity:	0-95% RH, non-condensing		

5. Hardware Installation and Configuration

5.1. Overview

A SmartMux-Lite analog I/O subsystem consists of a JDA4 multiplexer and one or more WRC 1781-7B or WRC7 Series analog input modules. The SmartMux-Lite is to be mounted on a EN50022 DIN rail (available from WRC and WRC's distributors as part number WRC 50022) in any orientation. The I/O module(s) plug into the top surface of the SmartMux-Lite and are secured to the device by the captive hold-down screw in each module.

Any module position can be any WRC 1781-7B or WRC7 Series analog input module. Each position can be any voltage or signal level, or not-used. Field wiring to the I/O modules is also provided by screw terminations on four (4) 3-pole connectors. Each measurement is individually corrected for temperature by an on-board cold-junction circuit.

The JDA4 contains two LEDs to indicate the status of the device and the status of the network. The device can be connected to the main DeviceNet trunk line or to a drop line via screw terminations on the open, pluggable 5-pin DeviceNet connector supplied with your unit.

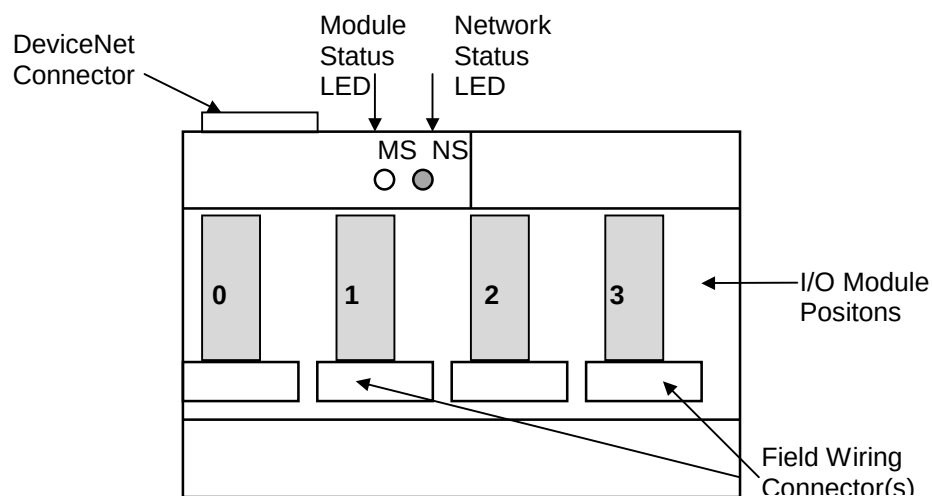


Figure 5-1 1782-JDA4 SmartMux-Lite

5.2. Configuration

A JDA4 can be configured for Mac Id, baudrate, and number of inputs returned in an I/O connection. The Mac Id is configured by using a third party tool, or changing attribute 1 of the Devicenet object (Class 3, Instance 1) to a value between 0 and 63. Upon completion of this command the device will automatically reset and come on line at the new address.

The baudrate can be configured in the same manner. Attribute 2 of Class 3, Instance 1, can be set to values 0,1, or 2, corresponding to 125K, 250K, and 500K baud. The new baudrate will not take effect until the device is reset physically or over the network.

The number of inputs returned can be configured for each I/O connection. This is done by changing the produced connection size in the appropriate connection instance. To make the Polled connection instance return the first three channels set Class 5, Instance 2, Attribute 7 to 6. This must be done while the connection is configuring, i.e. After allocating the connection, but before setting the expected packet rate.

5.3. LED Operation

A JDA4 Multiplexer has two LEDs that provide visual status information to the user about the product and the DeviceNet network. See Figure 5-1, Table 5-1 and Table 5-2.

Table 5-1 Module Status LED (labeled MS)

LED State	Module Status	Meaning
OFF	No Power	There is no power through DeviceNet.
Green	Device Operational	JDA4 is operating normally.
Flashing Green	Device in Standby	JDA4 needs commissioning.
Flashing Red	Minor Fault	Recoverable fault.
Red	Unrecoverable Fault	JDA4 may need replaced.
Flashing Red/Green	Device Self-Testing	JDA4 is in self-test mode.

Table 5-2 Network Status LED (labeled NS)

LED State	Module Status	Meaning
OFF	No Power / Not on-line	JDA4 has no power or has not completed the Dup_MAC_ID test.
Flashing Green	On-line, not connected	JDA4 is on-line but is not allocated to a Master.
Green	On-line	JDA4 is operating normally.
Flashing Red	Connection time-out	One or more I/O connections are timed out.
Red	Critical link failure	JDA4 has detected an error which makes it incapable of communicating on the link. (Bus off or Duplicate MAC ID).

5.4. Analog I/O

Table 5-3 lists the selection of analog I/O modules that can be used with the JDA4 multiplexers. These modules provide signal-to-signal and signal-to-system isolation up to 1500 volts. Refer to WRC's full line catalog for detailed I/O module information.

Table 5-3 1781 Series Analog I/O Modules

1781-	Sensor Type	24 Vdc Power Requirements	24 Vdc Current Requirements
7B14	Non-Isolated RTD	600 mW	25 mA
7B21	V dc	720 mW	30 mA
7B27	Low-Isolation T/C	600 mW	25 mA
7B30	mV/V dc	720 mW	30 mA
7B31	V dc	720 mW	30 mA
7B32	mA dc	720 mW	30 mA
7B33	V dc	720 mW	30 mA
7B34	100Ω Platinum RTD	720 mW	30 mA
7B34N	120Ω Nickel RTD	720 mW	30 mA
7B35	mA dc w/ Loop Power	1.68 W	70 mA
7B37	T/C - J,K,T,E,R,S,B,N	720 mW	30 mA
7B38	Strain Gage	1.92 W	80 mA
7B47	T/C - J,K,T,E,R,S,B,N	720 mW	30 mA

Table 5-4 WRC7 Series Analog I/O Modules

Module	Sensor Type	24 Vdc Power Requirements	24 Vdc Current Requirements
WRC7-32	mA, mV, V dc	720 mW	15 mA
WRC7-34	100Ω Platinum RTD	720 mW	25 mA

Warning: Do not insert and remove the I/O modules under power. Doing so may result in unexpected events in your operation and/or damage to the unit.

5.4.1. Field I/O Wiring

The JDA4 has four 3-position terminal blocks. Each analog channel has a terminal block marked “X”, “-” and “+” and the terminal block is connected as follows:

Table 5-5 Analog Input I/O Terminals

Terminal	Usage
X	Excitation signal for RTD inputs (used for 1781-7B14 or 1781-7B34 modules only)
--	Negative signal for all input types
+	Positive signal for all input types

Important: All modules are polarized. Proper operation requires that they be wired per the above chart. They will not work and may be damaged if the field wiring does not conform to the above chart.

In order to help ensure the integrity of your analog signal, we recommend that you shield low-level signals, such as from thermocouples, RTDs and other millivolt sources. This helps reduce or eliminate common-mode voltage noise that may be present in the installation environment. The shield should be connected at only one point. For an RTD, connect the shield to the “+” terminal; for all other signal inputs, connect the shield to the “-” terminal. Another option is to connect the shield to ground somewhere in your system. (Note: the JDA4 is not grounded.)

To read a process current input with the 1781-7B33, you must install a 250Ω resistor into the resistor socket (RS0 - RS3) next to the corresponding module position (0 - 3). Use WRCR250 or equivalent 0.1% metal-film resistor.

The pluggable wiring connector can accept I/O wire gage sizes 12 to 22 AWG, although 14-20 AWG is recommended.

5.5. Power Requirements

The JDA4 SmartMux-Lite subsystem is powered from the 11-25 Vdc provided by the DeviceNet network. The JDA4 consumes 35 mA of current at 24 Vdc, or 0.84 Watts, typical. Table 5-3 lists the power requirements of the analog I/O modules used with the JDA4. To determine the total power required by the SmartMux-Lite, be sure to use the total of the JDA4 and the I/O modules selected. The maximums are given in Table 5-6 below.

Table 5-6 JDA4 Power Requirements

Product	Max Power (no 7B35/38 Modules)	Max Power (with 7B35/38 Modules)
JDA4	4.0 W	8.0 W

Except for the 1781-7B35, power to and from the field actuators and sensors connected to the I/O modules is supplied by the user from the field wiring. No other external power supply is required to operate the JDA4.

5.6. Network Configuration

DeviceNet specifications provide for a maximum network distances for the main trunk line and drop lines, depending upon the baud rate used on the network. They are:

Table 5-7 Network Maximum Lengths

Baud Rate	Trunk Line Length		Drop Length			
	Maximum Distance		Maximum		Cumulative	
	Meters	Feet	Meters	Feet	Meters	Feet
125k baud	500 m	1640 ft	6 m	20 ft	156 m	512 ft.
250k baud	250 m	820 ft	6 m	20 ft	78 m	256 ft.
500k baud	100 m	328 ft	6 m	20 ft	39 m	128 ft.

5.6.1. Network Termination

A DeviceNet system **must be terminated at each end of the trunk line**. The host controller and the **last** SmartMux-Lite or other DeviceNet device on the network must always be terminated to eliminate reflections, even if only two nodes are present. The DeviceNet specifications for the terminating resistor are:

- 121 ohm
- 1% metal film
- 1/4 Watt

An appropriate terminating resistor, WRC part number RM121DN, is included with your SmartMux-Lite.

Important: Per the DeviceNet spec -- do not terminate devices on drop lines.

5.6.2. DeviceNet Connection Wiring

The supplied DeviceNet connection plug accepts cable sizes from 12 AWG - 24 AWG. The maximum wire size (12 AWG) has an area of 6530 circular mils and the smallest (24 AWG) has an area of 3265 circular mils.

Where not prohibited by local government or wiring regulations or company policy, multiple wires can be inserted each connection point on the plug as long as the total wire area does not exceed that of a 12 AWG wire. Use the chart below as a guide.

Phoenix Contact recommends using the same size wires when connecting more than one wire in a screw termination.

UL may require the use of crimped ferrules to connect multiple wires together.

Table 5-8 DeviceNet Wiring Termination

Wire AWG	Wire area (circular mils)	Maximum Wires per Terminal
12	6530	1
14	4110	1
15	3265	2
16	2580	2
18	1620	4 *
20	1022	6 *
22	645	9 *
24	404	16 *

* WRC does not recommend using more than 2 wires in any wire terminal.

The conductor sizes for DeviceNet cables are:

Table 5-9 DeviceNet Conductor Sizes

Function	Thick Wire	Thin Wire
Power	15 AWG	22 AWG
Signal	18 AWG	24 AWG

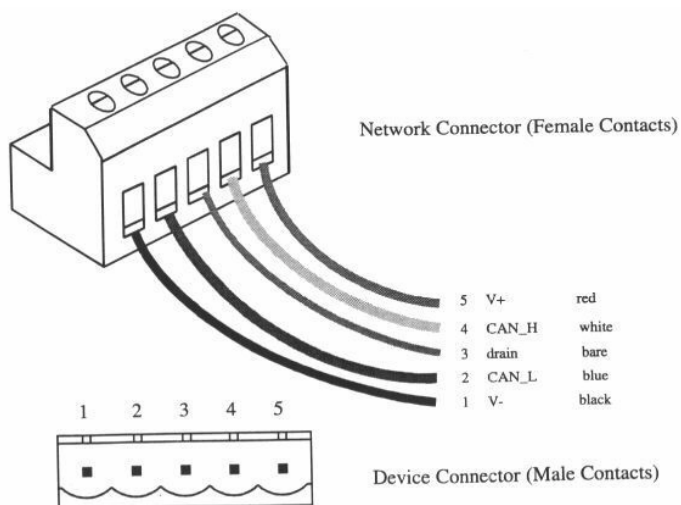


Figure 5-2 DeviceNet cable connector

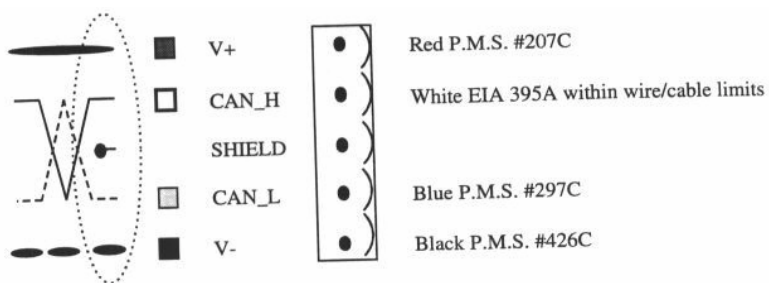


Figure 5-3 DeviceNet cable specifications

6. DeviceNet Profile and DeviceNet Objects

This section describes the DeviceNet Objects present in the SmartMux-Lite. The SmartMux-Lite conforms to a Type 7, General Purpose Analog I/O Device.

Table 6-1 JDA4 Device Profile

Object	# of Instances
Identity	1
Message Router	1
DeviceNet	1
Connection	4 (Explicit Msg, Polled I/O, Cyclic, Bit-Strobe)
Assembly	4
Analog Input	4
Analog Input Group	1
Acknowledgment Handler	1

The Analog Input Assembly Object is defined in Section 6.1 and the Analog Input Group Assembly Object is defined in Section 6.2.

6.1. Analog Input Point Object - Class 0A_{hex}

The JDA4 uses Analog Input Objects to store values. There are four instances, corresponding to the four analog inputs. The current value can be obtained by using the get attribute on attribute 3 (data) of the appropriate instance. No other instance attributes are supported.

6.1.1. Analog Input Assembly Data Format

Table 6-2 JDA4 Analog Input Assembly Data Attribute Format

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	0	0	0	0	0	0	Bit 9	Bit 8

Example:

Consider a poll response for any channel with the following bit pattern:

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	1	0	0	0	1	1	1
1	0	0	0	0	0	0	1	0

This corresponds to an analog value of 583 counts, or 56.93% full scale of the input.

6.1.2. Attributes and Services

Following are the Class Attributes, Instance Attributes and Services are supported by the SmartMux-Lite for the Analog Input Point Object.

Table 6-3 Class 0A_{hex} Class Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Revision	UINT	Revision of this object	The current value assigned to this is two (2).
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the JDA4.	The current value assigned to this is four (4).
6	Get	Max ID Number of Class Attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the JDA4.	The current value assigned to this is seven (7).
7	Get	Max ID Number of Instance Attributes	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the JDA4.	The current value assigned to this is three (3).

Table 6-4 Class 0A_{hex} Instance Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
3	Get	Value	INT	Input point value	10-bit value

Table 6-5 Analog Input Common Services

Service Code	Class	Instance	Service Name	Description of Service
OE _{hex}	Get	Get	Get_Attribute_Single	Returns the contents of the specified attribute.

6.2. Analog Input Group Object - Class 20_{hex}

In order to improve the network efficiency and reduce system overhead, the JDA4 uses implements an Analog Input Group, which provides a method of returning all 4 analog input data in one message.

6.2.1. Analog Input Group Assembly Data Format

Table 6-6 JDA4 Analog Object Assembly Instance Data Format (Instance 1)

Byte	Channel	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1		0	0	0	0	0	0	Bit 9	Bit 8
2	1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3		0	0	0	0	0	0	Bit 9	Bit 8
4	2	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5		0	0	0	0	0	0	Bit 9	Bit 8
6	3	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
7		0	0	0	0	0	0	Bit 9	Bit 8

6.2.2. Attributes and Services

Following are the Class Attributes, Instance Attributes and Services are supported by the SmartMux-Lite for the Analog Input Group Object.

Table 6-7 Class 20_{hex} Class Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Revision	UINT	Revision of this object	The current value assigned to this is one (1).
2	Get	Max. Instance	UINT	Maximum instance number of an object currently	The current value assigned to this is one (1).
6	Get	Max. ID Number of Class Attribute	UINT	Attribute ID number of the last class attribute of the class definition implemented in the device	The current value assigned to this is seven (7).
7	Get	Max. ID Number of Instance Attributes	UINT	Attribute ID number of the last instance attribute of the class definition implemented in the device	The current value assigned to this is ten (10).

Table 6-8 Class 20_{hex} Instance Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Number of Attributes	USINT	Number of attributes supported in this product	
2	Get	Attribute list	ARRAY OF USINT	List of attributes supported in this product	
3	Get	Number of bound instances	ARRAY of:	List of all points bound to this group	
4	Get	Instance ID	UINT		
5	Get	Status	BOOL	Group is operating without alarms or faults	0 = good 1 = alarm state

Table 6-9 Analog Input Group Common Services

Service Code	Class	Instance	Service Name	Description of Service
0E _{hex}	Get	Get	Get_Attribute_Single	Returns the contents of the specified attribute.
10 _{hex}	n/a	Set	Set_Attribute_Single	Modifies an attribute value.

6.3. Acknowledge Handler Object - Class 2B_{hex}

The DeviceNet specification requires the use of both acknowledged and un-acknowledged cyclic messages. The JDA4 uses the DeviceNet formal Acknowledge Handler to allow the master to request and receive either acknowledged or un-acknowledged cyclic messages. In general the use of acknowledged cyclic messaging provides for the slave device to take action if, for some reason, the master does not acknowledge the cyclic after a certain number of retries. This occurs, however, at the expense of increased network traffic. To reduce this traffic and increase network efficiency, unacknowledged cyclic messages may be desired.

If the JDA4 is operating in acknowledged mode, it will try to send the same cyclic message a second time if the first is not acknowledged. If still no acknowledgement is received, then no further action is taken and the JDA4 continues to operate as normal.

6.3.1. Attributes and Services

Following are the Class Attributes, Instance Attributes and Services are supported by the SmartMux-Lite for the Acknowledge Handler Object.

Table 6-10 Class 2B_{hex} Class Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Revision	UINT	Revision of this object.	The current value is 1.
2	Get	Max Instance	UINT	Maximum instance number of an object currently	The current value assigned to this is ().

Table 6-11 Class 2B_{hex} Instance Attributes

Attribute ID	Access Rule	Stub /Full	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Set		Acknowledge Timer	UINT	Time to wait for acknowledge before resending.	Range 1-65,535. Default = 16. (0 is invalid.)
2	Get		Retry Limits	USINT	Number of Ack Time-outs to wait before informing producing application of a Retry_Limit_Event reached.	Range 0-255. Default is 1.
3	Get		Cyclic Producing Instance	UINT	Connection Instance which contains the path of the producing I/O application object which will be notified of Ack Handler events.	Connection Instance ID. Current setting is 4.

Table 6-12 Acknowledge Handler Common Services

Service Code	Class	Instance	Service Name	Description of Service
0E _{hex}	Get	Get	Get_Attribute_Single	Returns the contents of the specified attribute.
10 _{hex}	n/a	Set	Set_Attribute_Single	Modifies an attribute value.

6.4. Assembly Object

The 1782-JDA4 contains four instances of the Assembly Object, 1,2, 3, and 4. Each instance corresponds to the number of channels returned when the data attribute(3) is requested in an explicit messaging connection. A get attribute command used on Instance 2, Attribute 3 of the Assembly Object would return the values of the first two channels.

Table 6-14 Assembly Object Instance Attributes

Attribute ID	Access Rule	Stub /Full	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
3	Get		Data	Array of USINT	2 Bytes describe one channel	Range 0-1023

6.5. I/O Connection Instances

Each I/O connection instance can be configured to return a specified amount of data. This is done during the configuration period of the connection. i.e. After the allocation request, but before the expected packet rate is set. The `produced_connection_size` (7) can be set to a value of 2,4,6, or 8 bytes. This corresponds to the number of channels read. If the `produced_connection_size` of a Polled connection is set to 6, the first three channels of data would be returned on a poll request.

Each connection can be configured independently, so a bit strobe response could return the first channel, while a cyclic response returned all of the data.

If the `produced_connection_size` is not set, it will default to 8 bytes or all channels returned.

Table 6-15 Connection Object Instance Attributes

Attribute ID	Access Rule	Stub /Full	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
7	Get(All) Set(I/O)		Produced Connection Size	Int	Describes numbers of bytes of data returned with this I/O connection. Can only be set while I/O connection is configuring	0,2,4,6,8
9	Get/Set		Expected Packet Rate	USINT	Expected Packet Rate for any connection. Will transition a connection from Configuring to active.	0-65535ms (rounded up to nearest 8ms)

7. Accessories

The following components can be used with a 1782-JDA4 SmartMux-Lite for replacements or spare parts.

<u>Part</u>	<u>WRC Part Number</u>
• DeviceNet link connector plug	1782-JD-DN-CK
• Current Conversion Resistor	WRCR250
• DIN rail	WRC 50022
• Terminating resistor	RM121DN
• Discrete I/O on DeviceNet	1782-JDB4 or 1781-JDB8
• Analog/Discrete I/O on DeviceNet	1781-JDA8

8. Troubleshooting

This section identifies some of the common problems observed when commissioning or operating a DeviceNet and SmartMux-Lite.

Problem:

Module Status LED is solid Green
Network Status LED is flashing Green
Device will not communicate on the network

Possible Solutions:

1. Network does not have a terminating resistor. Add a 121 ohm resistor across the CAN_H and CAN_L signals at the first and last nodes.
2. Incorrect baud rate.
3. Cabling not properly connected.
4. No messaging connections are allocated.
5. Message sent to incorrect node

Problem:

Module Status LED is solid Green
Network Status LED is solid Green
Device will not return data

Possible Solutions:

1. Incorrect Messaging connection set up.
(Poll request when only Explicit connection is allocated)
2. Message sent to incorrect node.

Problem:

Input value is always zero.

Possible Solutions:

Input is wired backwards. (A negative reading will bottom out at 0.)
Input is not connected.
Modules are not plugged into JDA4.
Incoming signal is less than the lowest range on the module.

Problem:

Input value is always 1023 (full scale).

Possible Solutions:

T/C input is not connected. (1781-7B27, -7B37 and -7B47 outputs will go to full-scale if not connected.)
Incoming signal is greater than the highest range on the module.

Problem:

Input value jumps around unexpectedly.

Possible Solutions:

Input signal to JDA4 is noisy. Provide a grounded shield around signal cable.
Make sure the signal cable shield is properly grounded at one location.